

## IPM PACKAGE: CUCURBITS (CUCUMBER/BITTERGOURD)

The IPM Innovation lab (IPM IL) has developed and tested practical IPM packages in vegetables. The IPM packages are holistic suites of IPM recommendations and practices from planting to market chain with an aim to enhance profitability from vegetable farming. These packages are economically and environmentally viable.



Bittergourds ready for harvesting



Seedlings grown under nylon net



Seedlings of cucumber grown in plastic tray



Transplanting of seedlings by farmers

### SITE SELECTION:

Compared to other vegetables, cucurbits have a stricter requirement of soil type as its root system develops and absorbs nutrients poorly. Sandy loam or sandy soils are considered best. The cucumber root system is shallow (only 25-30 cm deep from ground) resulting in poor ability to tolerate drought, flooding and making the crop susceptible to pests and diseases. Therefore its important to keep ploughed soil for 5-7 days, then apply lime to sterilize and kill soil-borne diseases.

### VARIETY SELECTION:

Selecting a high-yielding, locally-preferred Cucumber variety that is tolerant to insect transmitted virus diseases such as Cucumber mosaic virus (mostly transmitted by aphids).

### SEEDLINGS PREPARATION:

Seedlings are raised in poly bags with good fertile soil or solarized soil. Fertilizers are combined with *Trichoderma spp*, *Pseudomonas spp* and neem cake, which reduces the incidence of seedling diseases, weeds and nematodes. Similarly, using coco-peat and plastic trays to grow seedlings will provide an ideal medium resulting in disease free seedling, which will result in much more healthier and robust plants in the field, ultimately leading to a good harvest.

### SEED TREATMENT:

Treating seeds with fungus *Trichoderma viride* and the bacteria *Pseudomonas fluorescens* protects seedlings from fungal, bacterial and nematode attacks, increases seedling vigor, and induces plant defense against pests.

### SEEDLINGS IN NURSERY:

Using screens or nets against aphid vector can prevent or delay early virus infection. Extract from *Artemesia* or *Urtica dioica* (Titepati or Sisno) @1:5 (water) ratio reduces the insect problems

### ROUGING:

Monitoring and removing any disease or virus infected plants during early



Cue lure with soap water



Jhol mal



Bio-pesticide produced in Nepal



Adult of Red Pumpkin Beetle



Maggots of white fly

stage will prevent disease spread by insect vectors.

#### FERTILIZATION:

Well decomposed compost inoculated with *Trichoderma* spp and other bio-fertilizers (N, P, K) will reduce the disease incidence along with building-up of beneficial soil microbes. Use FYM or compost 1-1.5 ton/500 sq.m and 5 kg of DAP and 4kg Potash

#### INSECT TRAPS:

a) Setting up yellow sticky traps in the field will reduce aphids, whiteflies and thrips population, b) Pheromone traps should be installed in the field for Fruit fly early in the season.

#### STAKING:

Trellising should be done before vines start getting more tendrils to increase the air flow which will reduce the disease (e.g. Downy mildew) infestation.

#### BIO-CONTROL AGENTS:

Formulations of fungi *Verticillium*, *Paecilomyces*, *Metarhizium*, and *Beauveria* species are found effective against aphids and thrips.

## MAJOR INSECTS PESTS AND THEIR MANAGEMENT

### 1. RED PUMPKIN BEETLE

The grubs feed on the roots and underground portion of host plants and fruits touching the soil. Adult beetles feed voraciously on leaf lamina making irregular holes. They prefer young seedling and tender leaves and damage may even kill the seedlings.

- ◆ Collecting and destroying adult beetles in the morning.
- ◆ Use of Neem based pesticides can keep insect attack to minimum.
- ◆ Follow mixed cropping with maize, cowpea, bean.
- ◆ Use of repellents such as ash or mixture of ash and insecticidal dust.
- ◆ Follow crop rotation with legumes/ cereals.
- ◆ Drench the field with *Metarizium anisopliae* @ 10 gm/Ltr water.
- ◆ Soil drenching with contact pesticides (Malthion) as a last resort.

### 2. CUCURBIT FRUIT FLY

The fruit fly maggots feed inside the fruit causing sunken, discoloured patches, distortions and open cracks. These cracks serve as entry points for fungi and bacteria, causing fruit rot. Infested fruits decay and drop. The fly mainly prefer tender fruits for egg laying

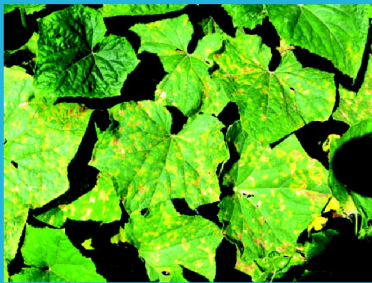
- ◆ Collect and destroy infested fruits.



Adult of white fly



Powdery mildew in cucumber



Downy mildew in cucumber



Virus cucumber



Virus in cucumber

- ◆ Pheromone traps can be set up in the field with 1% Methyl Eugenol or Citronella oil or Vinegar or Dextrose or Acetic Acid or Lactic Acid .
- ◆ Using mass trap bait (100g ripened pumpkin + 100ml soap water).
- ◆ Maize plants grown in rows at a distance of 8-10 cm in cucurbit field is effective as flies rest on such tall plants.
- ◆ Deep ploughing to expose hibernating stages.
- ◆ Frequent applications of neem can keep fruit fly attack to a minimum.
- ◆ Spraying Malathion @2ml/liter of water at fortnightly intervals.

## DISEASES AND THEIR MANAGEMENT

### 1. POWDERY MILDEW

White to dirty gray spots or patches appears on leaves which become white powdery as they enlarge. During severe infestation, powdery coating covers entire vine plant parts and causes defoliation

- ◆ Hot water treatment of seeds.
- ◆ Remove and destroy affected tissue and plant parts.
- ◆ Plant in sunny areas as much as possible, provide good air circulation, and avoid applying excess fertilizer.
- ◆ Spray cow urine and water at ratio 1:10 at a weekly interval.
- ◆ Spray *Ampelomyces quisqualis* @ 0.6g/liter of water. If needed, repeat spraying after 10-12 days.
- ◆ Fortnightly spray of 0.3% solution of wettable sulphur or using sulphur dust @15 to 20 kg/ha.

### 2. DOWNY MILDEW

Causes angular, chlorotic lesions on the foliage. During humid conditions, inspection of the underside of the leaf reveals gray-brown to purplish-black 'down'.

- ◆ Avoid over head irrigation.
- ◆ Promote air circulation and reducing leaf wetness thru trellising cucurbits, increasing plant or row spacing, and pruning older leaves.
- ◆ Spray Fusarium proliferatum, F.p. @ 0.6g / liter of water.
- ◆ Use systemic chemicals: Bavistin, Metalaxyl, Carbendazim, as last resort.

### 3. VIRAL DISEASES

These diseases result in losses through reduction in growth and yield and are responsible for distortion and mottling of fruit, making the product unmarketable. A complex of viruses is able to infect cucurbits. The most important viruses in cucumber are:

- ◆ Squash Mosaic Virus (SqMV)



Virus in cucumber



Damping off

- ◆ Cucumber Mosaic Virus (CMV)
- ◆ Zucchini Yellow Mosaic Virus (ZYMV)

- Ø Use Diseases free seeds and seedlings.
- Ø Remove and destroy affected plant.
- Ø Using nylon net to grow seedlings.
- Ø Managing insect vectors such as whiteflies and aphids..
- Ø Destroying old plants immediately after harvest.
- Ø Remove all weeds since these may harbor both CMV and aphids.
- Ø Use of reflective mulches will help reduce aphid population.
- Ø No chemical pesticides strategies are effective against viruses.

### 3. DAMPING OFF

This disease mostly attacks seedling stage. In transplanted seedlings, they attack in ring form in the stem and stem nodes and then the plants rots and fall down to grounds.

- ◆ Nursery should be always established in south facing plot.
- ◆ Make raised nursery bed and drenching bed with Trichoderma solution.
- ◆ Manage irrigation water. Apply required amount and in time. There should be good drainage system.
- ◆ Treat the soil with Trichoderma.
- ◆ In heavy invasion apply Bavistin@2gm per sq. m area.

### IMPORTANCE OF POLLINATORS IN CUCUMBER :

Most cucumbers, whether monoecious or gynoeious, require insects to transfer pollen between flowers of the same or different plant. Therefore, it becomes essential to have pollinators such as 'bees' in or alongside the field. Generally about 30% of the flowers in the gynoeious plantings should be male in order to optimize pollination and economic return. Therefore, it's recommended to have at least one colony of honey bees per hectare if applicable. It is best to place the colonies in the field about 6 days after bloom starts. Similarly, plating arugula, radishes, mustards, buckwheat, white clover and red clover alongside the main field will attract pollinators foraging. This ensures that flowering will be sufficient to attract pollinators into the field. As several factors impact pollination such as scarcity of bees/pollinators, rainy weather which keeps the bees at home, the use of insecticides which can kill the bees/pollinators and high temperatures which can affect the pollen and make it sterile. It becomes important that farmers are well-aware of these factors and are proactive to react.



Honey Bee



Bumble Bee



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